REMARKS

This response follows an Action of July 24, 2001 rejecting claims 1-7. The applicant affirms the election to the specie of Fig. 1. Should claim 1 issue in a generic form, it is believed that claims 8-13 will avest be recaptured.

With respect to the Examiner's requirements concerning claims 4 and 7 as being portrayed in the figures, those claims have now been amended so that they are portrayed in Fig. 1. For example, claim 1 requires that the injection orifices "comprises at least two which are symmetrically positioned around the circumference of said nozzle". The phrase "at least two" thus does not preclude more such as the three nozzles portrayed in Fig. 1 and the symmetrically positioning requirement of claim 4 is portrayed based on the equal distance separation of Fig. 1.

With respect to claim 7, which is supported in the specification on page 5, upon a finding of allowable subject matter the applicant will provide an additional figure which moves the injection points (5) different distances from the throat and adds a distribution device for feeding one or more of those injection orifices. For the convenience of the Examiner attached is a sketch which will be labeled as Fig. 3, a proposed new figure which corresponds to the disclosure on page 5 and shows the presence of the injectors at three different locations relative to the throat (3) controlled by a distribution device.

The Examiner has held that there is no basis in the specification for the phrase "separation triggering elements". These elements take the form of two distinct structural components. The first are the injection orifices (5) are disclosed on page 7 beginning at line 3. In the second embodiment of the triggering elements are the injection tubes (10). These are discussed on page 12. It is believed, for example that the disclosure on page 12 beginning at line

14 provides a basis in the specification for the function of those triggering elements in terms of creating a separation, in the case of the Fig. 2 embodiment at each point of impact (12).

The Applicant has thoroughly amended claims 1-7 to address each and every issue raised by the Examiner in the rejection under 35 U.S.C. § 112 second paragraph. Additionally, claim 1 has been amended to distinguish this invention over the prior art in two respects. First, the applicant has amended claim 1 to specify that the initiation points are located in the nozzle body and are positioned downstream from the throat. This distinguishes Applicants invention over Wilhite.

Secondly, the Applicant has amended claim 1 to define that the separation triggering elements are actuated simultaneously to generate distinct zones of jet separations from mutually distinct initiation points. This distinguishes the invention over both Kranz and Mueller.

Based on those amendments and their marks the follows reexamination is respectfully requested.

As set forth in Applicants claims and specification, this invention relates to an engine nozzle of the type in which a spontaneous separation of flow occurs when the nozzle operates within the atmosphere. The result then is that the jet separation is unstable and requires that it be controlled. The problem is recognized in the art and Wilhite is cited by the Examiner as defining a structure that satisfies Applicants claims. However, in this reference the points of fluid injection are located in the throat of the nozzle. The purpose is to form what the reference calls "a nonstructural throat (34)". This is smaller is diameter than the size of the actual throat of the nozzle, that is the structural element itself. Reference is made to column 2, lines 53-63. The

formation of the so-called nonstructural throat (34) is defined as being positioned anywhere within the structural confines of the actual throat of the nozzle. Reference is made to column 2, lines 64 through column 3, line 15. The purpose is to control rocket acceleration and achieve dimensional control, that is pitch and yaw. This is typical in the context of the nozzle which operates in a flow regime of non-separation. Otherwise, the artisan would recognize that injection would not be efficient to the extent that it could create a side force for the control of the direction as opposed to pure thrust. In that regard, it is clear that the references used to control the direction of the rocket by using this nonstructural throat for the purpose of producing a thrust vector which is not aligned with the access of symmetry of the nozzle.

Mueller is no more relevant. This prior art publication is identified by the Applicant of page 2, at line 25 and discussed as a prior art attempt for which this invention offers distinct advantages. In particular, Mueller describes a configuration to ensure axial rotational symmetry for the purposive gas flow. This requires the presence of a large number of closely spaced holes which are disposed along a coaxial ring with the nozzle. The alternative equivalent is a continuous slot extending over the entire circumference of the nozzle. Jet separation is obtained not in discreet zones of jet separation but rather, as a continuum along the circumference.

Applicant's invention reduces the unsteady flow state by a more efficient manner using a small number of injection ports to create a three dimensional partitioning of the purposive gas flow. Thus, Applicant's invention achieves distinct zones of jet separation. In Mueller, jet separation commences at a random point on the injection ring and the precise location of this point is unstable. Applicant's invention avoids this drawback in the prior art by having several

distinct zones of jet separation at predetermined locations. Each of these zones of separation has a conical configuration. Reference is made to Fig. 1 which shows this as element 6. Thus, these zones remerge downstream to form an entirely separated jet at the exit point of the nozzle. This does not affect the direction of thrust that remains aligned with the axis of symmetry of the nozzle.

Finally, Kranz defines a thrust vector axis by employing injection points to deflect the jet toward one of four nozzle sections to which it adheres by using the Coanda effect. In Kranz injection is not applied simultaneously through all of the injection points. The thrust vector control therefor is not one of a jet separation and secondly the thrust is not parallel to the axis of the nozzle to control the thrust vector. Applicant's claims define separation triggering elements that are actuated simultaneously to generate distinct zones of jet separation from mutually distinct initiation points. Kranz therefor is not relevant.

In summary then the Applicant requests that the Examiner reconsider the propriety of the rejections based not only on the amendments made to the claims but also these remarks. Should the Examiner have any questions he is requested to contact the undersigned attorney of record at the local exchange listed below.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,

Neil B. Siegel
Registration No. 25,200

SUGHRUE MION, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

Date: November 26, 2001

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A rocket engine nozzle comprising: a combustion chamber, a throat and a divergent nozzle body downstream of said throat, a system for controlling jet separation of the flow in the nozzle, [wherein] said control system [exhibits] comprising a plurality of separation triggering elements [(5,10)] arranged [in such a way as] to simultaneously generate, from mutually spaced initiation points positioned in said divergent nozzle body [(9)], distinct zones [(6)] of jet separation, [so as] to form a three-dimensional separation of the flow.

Format

D R

Rocket engine

2. (Amended) the nozzle as claimed in claim 1, wherein the [flow control system exhibits a device] separation triggering elements comprise injection orifices positioned for injecting fluid through a wall of the nozzle[, which exhibits, in] at least one injection cross section, disposed substantially perpendicular to the wall of the nozzle, at least two independent injection orifices [(5)] being distributed over the perimeter of the wall of the nozzle, each injection orifice [(5)] constituting a [said] discrete separation triggering element inducing a [said] distinct zone [(6)] of jet separation.

Grammar

3. (Amended) The nozzle as claimed in claim 2, wherein the injection orifices [(5)] are uniformly distributed over the perimeter of the wall of the nozzle [(4)].

4. (Amended) The nozzle as claimed in claim [3], wherein the nozzle is conical and the injection orfices comprise [(5) are] at least two [in number and] which are [diametrically opposed] symmetrically positioned around the circumference of said nozzle.

5. (Amended) The nozzle as claimed in claim 3, wherein the injection orifices [(5) are] comprise 3 in number and are arranged at substantially 120° to one another over the perimeter of the nozzle [(4)].

6. (Amended) The nozzle as claimed in [claim 1] claim 2, wherein said injection cross section is arranged at distance D from the throat [(3) of the nozzle] which is substantially less than [the] a distance [Do] of spontaneous separation of the flow.

7. (Amended) The nozzle as claimed in claim 6, wherein the injection device [exhibits] comprises a plurality of injectors [(5)] situated at different distances from the throat [D], and a disturbing device for selectively feeding [one or other of] said injectors at different cross [sections] sectional locations [(5), in such a way as] to take into account the variation of said distance [Do] of spontaneous of the flow as a function of altitude.